Product Rule

$(fg)' = f'g + fg'$

S

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

D

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

S

day 25

3.4/15 $f(x) = (x-1)(3x+4)$

~~Product Rule~~

$f'(x) = \frac{d}{dx}(x-1)(3x+4) + (x-1)\frac{d}{dx}(3x+4)$

$= (1)\ (3x+4) + (x-1)(3)$

$= 6x+1$

$\frac{d}{dx}(e^{kx}) =$

D ke^{kx}

multiply out

$\frac{d}{dx}(3x^2+x-4) =$

$6x+1$

Oct 2-7:18 AM

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4 /8) find derivative of $g(x) = 6x - 2xe^x$

$g'(x) = \frac{d}{dx}(6x) - \frac{d}{dx}(2xe^x) = 6\frac{d}{dx}(x) - 2\frac{d}{dx}(xe^x)$

$= 6 - 2\left[\frac{d}{dx}(x)\cdot e^x + x\cdot\frac{d}{dx}(e^x)\right] = 6 - 2\left[1\cdot e^x + x\cdot e^x\right]$

$= 6 - 2e^x - 2xe^x$

Oct 2-7:18 AM

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/29 find derivative of $f(w) = \frac{w^3 - w}{w}$

Quotient Rule

$$f'(w) = \frac{\frac{d}{dw}(w^3 - w) \cdot w - (w^3 - w) \cdot \frac{d}{dw}(w)}{(w)^2}$$

$$= \frac{(3w^2 - 1)(w) - (w^3 - w)(1)}{w^2}$$

$$= \frac{(3w^3 - w) - (w^3 - w)}{w^2}$$

$$= \frac{2w^3}{w^2} = 2w$$

$$\frac{w^3 - w}{w} = \frac{w^3}{w} - \frac{w}{w} = w^2 - 1$$

$$\frac{d}{dx}(w^2 - 1) = 2w$$

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/30 $y = \frac{4s^3 - 8s^2 + 4s}{4s} = s^2 - 2s + 1$

Quotient Rule

$$y' = \frac{\frac{d}{ds}(4s^3 - 8s^2 + 4s) \cdot 4s - (4s^3 - 8s^2 + 4s)\left(\frac{d}{ds}(4s)\right)}{(4s)^2}$$

$$= \frac{(12s^2 - 16s + 4)(4s) - (4s^3 - 8s^2 + 4s)(4)}{16s^2}$$

$$= \frac{48s^3 - 64s^2 + 16s - (16s^3 - 32s^2 + 16s)}{16s^2}$$

$$= \frac{32s^3 - 32s^2}{16s^2} = 2s - 2$$

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/9)

$f(t) = t^5 e^t$

$f'(t) = \frac{d}{dt}(t^5) \cdot e^t + (t^5)\frac{d}{dt}(e^t)$

$= 5t^4 \cdot e^t + t^5 (e^t)$

$= 5e^t t^4 + e^t t^5$

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/20

$f(x) = \frac{x^3 - 4x^2 + x}{x-2}$

QR

$$f'(x) = \frac{\frac{d}{dx}(x^3-4x^2+x)\cdot(x-2) - (x^3-4x^2+x)\left(\frac{d}{dx}(x-2)\right)}{(x-2)^2}$$

$$= \frac{(3x^2-8x+1)(x-2) - (x^3-4x^2+x)(1)}{(x-2)^2}$$

$$= \frac{3x^3 - 8x^2 + x - 6x^2 + 16x - 2 - (x^3 - 4x^2 + x)}{(x-2)^2}$$

$$\frac{g(x)}{r(x)} = \frac{2x^3 - 10x^2 + 16x - 2}{(x-2)^2}$$

$g(2) = 2(2)^3 - 10(2)^2 + 16(2) - 2 = 16 - 40 + 32 - 2 = 6$

$r(2) = 0$

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/20

$f(x) = \frac{x^3 - 4x^2 + x}{x-2}$

$$
\begin{array}{r}
x^2 - 2x - 3 \\
(x-2)\overline{)\,x^3 - 4x^2 + x} \\
-(x^3 - 2x^2) \\
\hline
-2x^2 + x \\
-(-2x^2 + 4x) \\
\hline
-3x \\
-(-3x + 6) \\
\hline
-6
\end{array}
$$

$\frac{x^2 - 2x - 3}{x-2} = x^2 - 2x - 3 + \frac{-6}{x-2}$

$\frac{d}{dx}\left(\qquad \right) = 2x - 2 + \frac{d}{dx}\left(\frac{-6}{x-2}\right)$

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.4/21

$f(x) = \frac{e^x}{e^x+1} = \frac{(e^x+1)-1}{e^x+1} = 1 - \frac{1}{e^x+1}$

OR

$f'(x) = \frac{\frac{d}{dx}(e^x)\cdot(e^x+1) - e^x \cdot \frac{d}{dx}(e^x+1)}{(e^x+1)^2}$

$= \frac{e^x(e^x+1) - e^x(e^x)}{(e^x+1)^2} = \frac{e^{2x} + e^x - e^{2x}}{(e^x+1)^2} = \frac{e^x}{(e^x+1)^2}$

Oct 2-7:18 AM

Product Rule

$(fg)' = f'g + fg'$

Power Rule

$\frac{d}{dx}(x^n) = nx^{n-1}$

Quotient Rule

$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

day 25

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

3.5 Main Ideas:

$\lim_{x\to 0} \frac{\sin x}{x} = 1$

$\lim_{x\to 0} \frac{\cos x - 1}{x} = \lim_{x\to 0} \frac{1-\cos x}{x} = 0$

ex am pull

$\lim_{x\to 0} \frac{\sin 3x}{\sin 5x}$ is difficult. So

$\lim_{x\to 0} \frac{\sin 3x}{\sin 5x} = \lim_{x\to 0} \frac{\frac{\sin 3x}{x}}{\frac{\sin 5x}{x}} = \lim_{x\to 0} \frac{3\left(\frac{\sin 3x}{3\cdot x}\right)}{5\left(\frac{\sin 5x}{5\cdot x}\right)}$

$= \lim_{x\to 0} \frac{3(1)}{5(1)} = \frac{3}{5}$

$\frac{d}{dx}(\sin x) = \cos x$; $\frac{d}{dx}(\cos x) = -\sin x$